CRACK GROWTH ANALYSIS USING MESH SUPERPOSITION METHOD AND X-FEM

S. Nakasumi[a] , **K. Suzuki**[b] and **H. Ohtsubo**[c]

[a]Department of Environmental and Ocean Engineering Faculty of Engineering
University of Tokyo
Hongo 7-3-1, Bunkyo-ku Tokyo Japan
sumi@nasl.t.u-tokyo.ac.jp

[b]Graduate School of Frontier Sciences
University of Tokyo
Hongo 7-3-1, Bunkyo-ku Tokyo Japan
katsu@k.u-tokyo.ac.jp

[c]Department of Environmental and Ocean Engineering Faculty of Engineering
University of Tokyo
Hongo 7-3-1, Bunkyo-ku Tokyo Japan
ohtsubo@nasl.t.u-tokyo.ac.jp

In this paper, we present a methodology to analyze crack growth in highly accuracy and flexible modeling by means of mesh superposition method and extended finite element method (X-FEM).
The mesh superposition method has first presented by Fish *et al.* [1] as adaptive s-method. This method increases the accuracy of analysis locally by superimposing additional mesh of higher resolution on the global mesh that represents rough deformation of structures. The large feature of this method is that boundaries and nodes in the two meshes do not have to coincide with each other. Therefore, modeling process becomes very flexible. This method is very effective for the analysis of models that involve crack surfaces, because only the local mesh needs to have the crack surface, and the global mesh can be continuous. However, in the analysis of crack growth, the process of re-mesh for the local mesh is still indispensable, and which is often cumbersome.
On the other hand, X-FEM has presented by Belytschko *et al.* [2,3]. By enriching discontinuous functions and asymptotic near-tip functions into nodal degrees of freedom, X-FEM enables analysis of discontinuous field such as crack without conforming meshes to the crack surface. Moreover, the process of re-mesh is not necessary with crack growth.
In numerical examples, we will show some crack growth problems that are almost impossible with traditional FEM analysis.

References

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